Gas Journal

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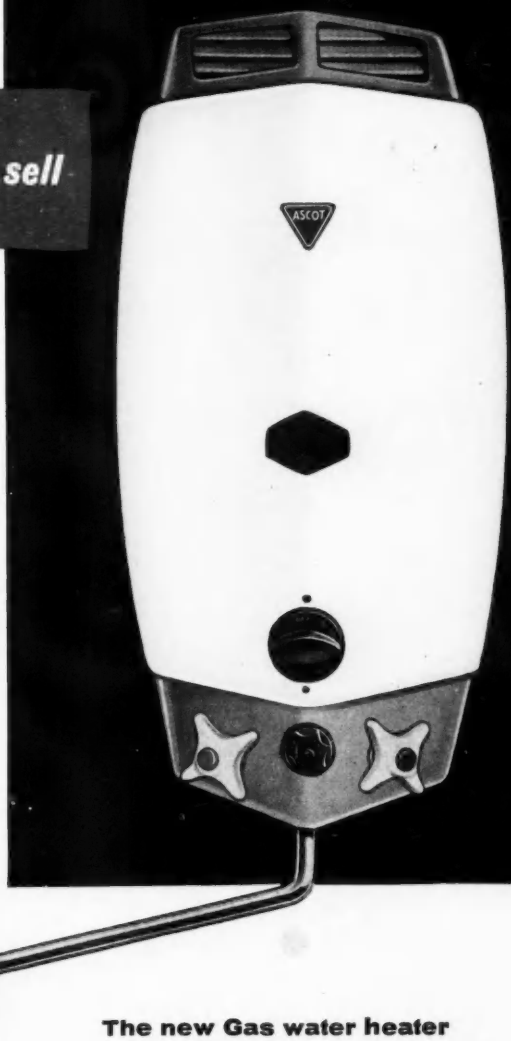

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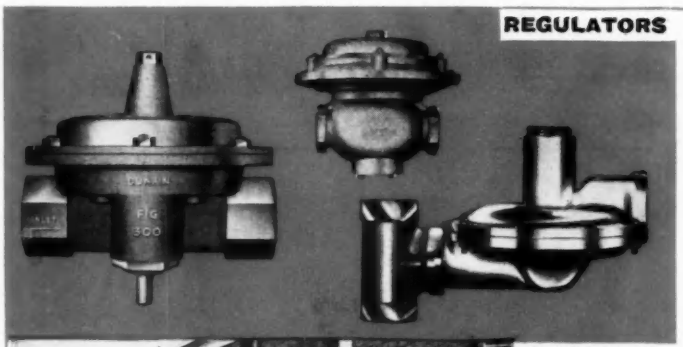

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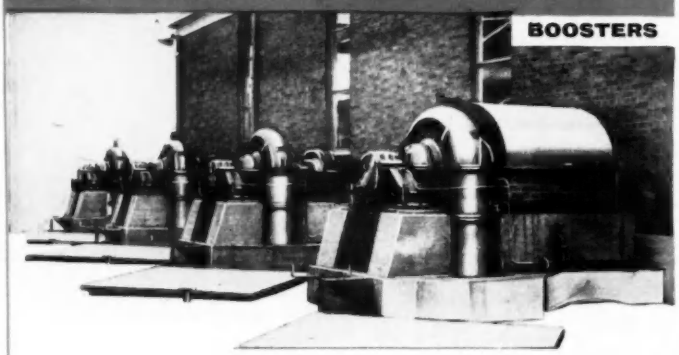

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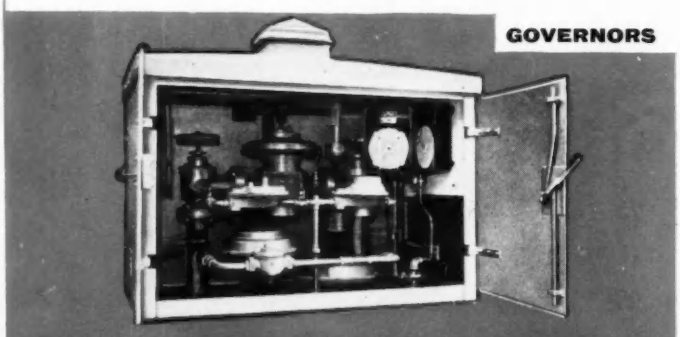

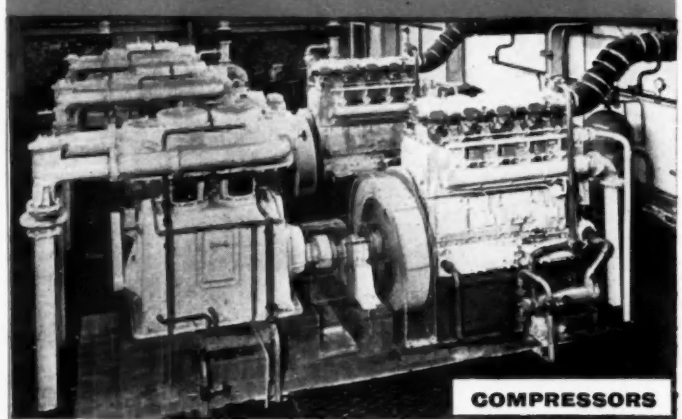

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Gas Journal

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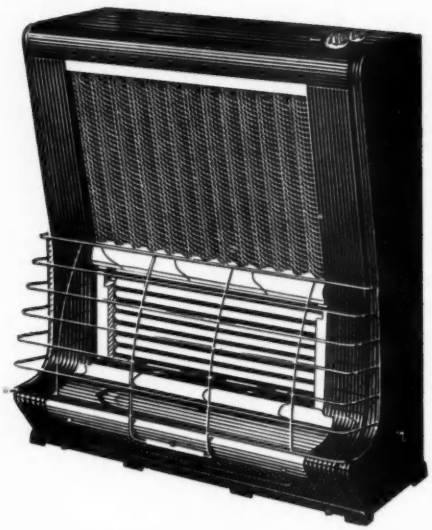

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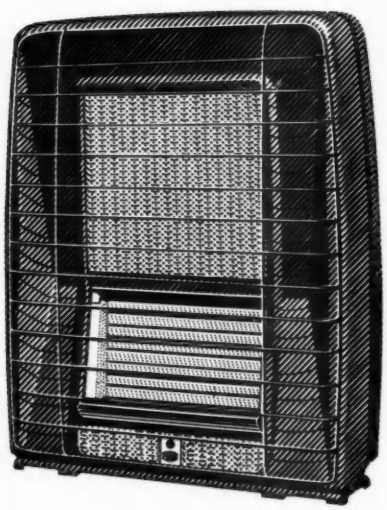

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Gas Journal

COKE OVENS • BY-PRODUCTS • CHEMICALS

Increasing demands for by-products?

THE present series of articles dealing with chemicals and by-products, now appearing in the 'GAS JOURNAL,' has prompted us to turn our attention once again to the recently published Wilson report on coal derivatives, to refresh our memory on what that particular commission had to say about the possible increases in coal utilisation which might result in the creation of a greater demand for coal tar products. This has been exercising the minds of coal scientists for many years and much research work has been carried out on possible ways of processing coal, treating it essentially as a source of chemical raw material and not in the first instance as a fuel.

The two branches of the carbonising industry which undertake the great majority of the coal processing in this country, the gas and metallurgical coking industries, clearly do not have the manufacture of coal chemicals in the forefront of their production programmes, but each has as its goal, a type of refined fuel. As we pointed out in our editorial last week, we are not differentiating between our own and our sister industry in our overall view of the recovery of by-products, since 'both industries use the same raw material and employ basically the same process for its treatment, although each is directed towards the manufacture of its own main product'. Within the limits of manufacturing this main product, in one case gas and in the other hard coke, the production of chemicals must be fitted.

The coking industry has shown a tendency in the post-war years to concentrate its manufacturing capacity into plants of increasing size in the same way as the gas industry has done, but its plants, already large, have continued to exceed in size any carbonising plant in the gas industry with the notable exception of the two largest London gasworks. This has made it possible for the coking industry to continue to process its own by-products with a view to producing finished saleable chemicals or the supply of intermediate products as raw materials to other branches of the chemical industry. The gas industry on the other hand, with the two exceptions already referred to, relies on co-operative tar distillers for the refining of its crude tar and crude benzole, and its ammonia it disposes of as concentrated liquor for further treatment outside the industry.

Here then is one of the main differences in outlook between the two sources of coal-derived chemicals. It is not surprising therefore to find other differences in detail, such as the selective placing of pieces of ancillary plant at the coke works which would be in different relative positions at the gasworks. The quality of the products themselves is different too, and here perhaps is a point of the greatest importance. The manufacture of gas in a coke oven under conditions where a greater degree of cracking is possible, tends to form products containing a greater proportion of aromatic derivatives than is common with the liquid hydrocarbon products recovered from a steamed vertical plant at a gasworks. The gasworks 'benzole' for instance is likely to contain a higher proportion of aliphatic homologues and naphthenes than is to be found in coke oven 'benzole.' The incentive for refining the former for the production of high grade basic materials for chemical synthesis is slightly less when it is remembered that aliphatic hydrocarbons and their derivatives are more easily obtained from the oil industry. It is also a more costly process to refine the aromatic hydrocarbons in benzole produced from gasworks.

The ability of the market to absorb from the carbonising industries any additional aromatic hydrocarbon raw materials is considered most carefully by the Wilson report. It is clear that here lies the most important factor to be considered when calculating whether any increase in coal processing is economically possible. The market for highly refined aromatic hydrocarbons, benzene, toluene, xylene and naphthalene, appears to be fairly stationary except for naphthalene, the demand for which has risen greatly since the war for the manufacture of phthalic anhydride as a basic material for plastics. The excess of potential benzene products available can be absorbed in the production of motor spirit and naphtha, the latter for the manufacture of solvents for the paint and other industries.

There are, however, two important coal tar chemicals that are produced at present in inadequate quantities

and these are para-xylene and phenol. The former can be, and is being, manufactured from oil products and the increased requirements for phenol can be met by synthesis from benzene. Increased demands for naphthalene can be met by production from para-xylene—from petroleum—α and β methyl naphthalenes and from phenanthrene. Some 170,000 tons of the three latter substances are contained in the coal tar produced every year in this country, which could be extracted and used if it was needed.

Until oil refining was established in this country, the only sources of high grade aliphatic compounds in Great Britain were acetylene and molasses. Acetylene is made from carbide, which in turn needs cheap electricity for its manufacture, so out of about 219,000 tons used, some 74,000 had to be imported. Today many of the aliphatic chemicals required are supplied by the olefines from the oil industry, and now amount to some 400,000 tons per year. This source supplies the necessary basic materials for the manufacture of solvents, thermoplastics, plasticisers and synthetic detergents. Acetylene, the total demand now at 48,000 tons a year, is the basic material for vinyl chloride, trichlorethylene and acrylonitrile.

The outlets for chemicals and by-products from the carbonising industries appear to be reasonably constant, and there is unlikely to be any falling off in demand. In fact a steady increase in aromatic hydrocarbons seems likely, but an overall change in the type of coal-derived product is hard to envisage unless the present tendency of the gas industry to change from conventional gas-making processes to complete gasification quickly becomes an accomplished fact.

If this is so—the report recommends a speed-up in the production of synthesis gas by the slagging gasifier—the market for coal tar products of high aromatic content will make greater demands on the coking industry which will be deprived of any assistance from the gas industry. Full use of the increased potential for pure products, now being sold as motor spirit, will have to be more completely utilised, with a possible increase in revenue. Whether the oil industry can increase its output of aromatic compounds or not, we feel that the by-products industries should increase in importance.

International Kitchen rides again

THAT tried, and presumably trusted, attraction, International Kitchen, is back at the Food Fair which is currently attracting would-be gourmets to Olympia. The Gas Council has decided to give the idea another spin, presumably hoping that some of the former glitter may remain, even though the novelty has worn off. Accordingly one can see 12 kitchens manned by expert cooks from America, Belgium, Denmark, France, Ghana, India, Italy, the Netherlands, Pakistan, Spain, the West Indies and—representing the home country—Wales.

It cannot be said that the kitchens are more attractive than ever because their designers achieved such a high standard last time that it could hardly be bettered. Suffice it to say that they look very delightful and that the ladies who perform culinary feats upon them are equally charming. Although the stand is situated rather in the 'outback' we do not think this is likely to cause it to lose visitors, particularly in view of the Gas Council's effective 'signposting'. The latter is one of several improvements in this 1960 edition. Access to the kitchens is much easier (previously they were so screened that visitors had to filter through a narrow entrance) and it seems easier to get round.

It might be thought that, despite its undeniable appeal, International Kitchen does not constitute a very successful selling stand because the fact that *gas* is being used tends to become obscured by the general dazzle of national costumes and dishes, and because the link between what is happening on the stand and the appliance display (only cookers, refrigerators and water heaters) is a rather tenuous one. In fact sales results can be very good and we hope that this year's edition will outshine the very respectable total achieved last time. But such results can only be achieved by pretty hard selling—harder selling than at the Ideal Home, we suspect. That being so, we are baffled by the fact that of the 18 ordinary salesmen staffing the display this year (from the Eastern, North Thames, South Eastern and Southern Boards) only two have had previous experience of selling at national exhibitions. Could the reason hinge on the commission earned by former exhibition staff and the feeling that others must be given equal opportunity? Whatever the reason we doubt if it counter-balances the failure to make use of men experienced in this particular field of selling. We intend no disrespect to those who are working at the show for the first time; no doubt they will hope that when they have had experience of this kind of work, their services will be in demand on future occasions.

Reverting to the display of appliances, if International Kitchen is to make some other appearance in future, we wonder whether the appliances in use in each kitchen might not be duplicated by the side of the kitchen with some such caption as 'This is the cooker on which the Indian cooks are preparing their lamb curry,' and so on. This in addition to a general display of appliances.

Despite these minor criticisms, this is a bright and interesting feature and should at least hold its own with its chief rival, E.D.A.'s 'Life with a Song', a five-minute musical show tied up with a song title contest, from which 25-seater theatre visitors exit through an effective appliance display.

Certainly International Kitchen has had an excellent press and was the subject of an extremely generous slice of air time in the B.B.C.'s News Extra last Friday.

Hydrorefining of benzoles and naphthas

By D. BRADLEY,
A.R.I.C.
Newton, Chambers & Co. Ltd.

CRUDE benzole is a mixture of benzene, toluene and xylene containing varying amounts of impurities, the quantity of which depends on the source of the material. There are two main classes of impurity, on the one hand the sulphur compounds and on the other the saturated and unsaturated hydrocarbons. Regardless of the eventual use of the benzole, it is necessary in most cases to remove some sulphur from the benzole, and with present trends towards product manufacture it is also necessary to remove the hydrocarbons.

Hydrorefining offers a convenient method of removing sulphur by converting it to the gaseous hydrogen sulphide, and at the same time converting the unsaturated hydrocarbons to the more stable saturated form. One then has the problem of separating the aromatics from the non-aromatic hydrocarbons, but the destruction of unsaturateds, bringing with it a serious effluent problem, is not encountered as it is with the acid washing process.

The hydrorefining of naphtha is even more desirable from the effluent viewpoint, and the saving effected in converting the unsaturateds to saleable products is an extremely desirable feature.

TABLE 1.

1	Thiophene + $4H_2$	= Butane + H_2S	— 65.90 k. cal/mol C_4H_4S
2	$CS_2 + 4H_2$	= $CH_4 + 2H_2S$	— 55.08 k. cal/mol CS_2
3	Cyclopentadiene + $2H_2$	= Cyclopentane	— 50.87 k. cal/mol CPD.
4	Styrene + H_2	= Ethyl Benzene	— 29.55 k. cal/mol C_8H_8
5	Phenol + H_2	= Benzene + H_2O	— 16.3 k. cal/mol C_6H_6O
6	$O_2 + 2H_2$	= $2H_2O$	— 117.4 k. cal/mol O_2
7	C_2H_4 Ethylene + H2	= C_2H_6 Ethane	— 34.12 k. cal/mol C_2H_4
8	$CO + 3H_2$	= $CH_4 + H_2O$	— 52.69 k. cal/mol CO

With the exception of paraffins and naphthenes, all the compounds present in benzoles and naphthas are susceptible to hydrogenation. These reactions are catalytic, and it was apparent that if a catalyst could be chosen which would cause only the hydrogenation of the undesirable compounds, a method of benzole refining would present itself. Fortunately the solution of this problem has been accomplished and a catalyst which is selective to the hydrogenation of sulphur, nitrogen and oxygen compounds and unsaturateds is now available. These reactions are shown in Table 1. Several variations of this class of catalyst are available, the finer points of which are of great importance in the detailed operation of hydrorefining plants. This is illustrated by the fact that while the selectivity of the catalyst is almost complete, some very slight hydrogenation of aromatics is possible. The degree of control of these reactions has been the subject of a great deal of research.

Having resolved the question of the catalyst, the refining is accomplished by passing a mixture of the vaporised benzole, in the presence of hydrogen, at an elevated temperature and an elevated pressure, over the catalyst. The reaction products are then condensed from the gas as a desulphurised, saturated liquid. There now remains the chemical engineering problem of how to carry out the unit operation. To enable the assessment of these operations, reference is made to the flow diagram in Fig. 1. In this example coal gas is used as the hydrogenation medium, which necessitates some purge of the reacted gas, to retain the correct hydrogen concentration over the catalyst. Fresh gas is compressed and is joined by recycle gas from the end of the system. This stream is passed through a heater before entering the evaporator, in which the gas comes in contact with the benzole, or naphtha, to be treated. The benzole passes from storage via a pump, through a heat exchanger into the evaporator.

Rising temperature

The latent heat of vaporisation is supplied by the reaction products which pass through a heat exchanger in the bottom of the evaporator vessel. The gas and vapour leave from the top of the evaporator while a heavy residue is removed from the base. The gaseous mixture is then preheated before passing to the catalyst convertor which, as its name suggests, houses the catalyst and is also the vessel in which the reactions take place.

Since the hydrogenation reactions are all exothermic, a temperature rise is encountered across this vessel, the gases leaving at about 400°C. The reaction gases are then cooled by first passing through the evaporator heat exchanger, then to the benzole preheater, before being finally condensed and cooled by water in the condenser.

As previously mentioned, some of the coal gas is purged from the system, but the majority is recycled. The benzole is saturated with H_2S and other permanent gases, and it is necessary to remove these by steam stripping in a small column as soon as possible, after leaving the hydrorefining plant.

CHEMICALS AND BY-PRODUCTS

In order to examine the chemical engineering aspects associated with this process, a demonstration plant was constructed at the Thorncliffe works of Newton, Chambers & Co. Ltd.

The plant shown in Fig. 2 is capable of treating 500 gal. of crude benzole per day. As can be seen, the construction of a small plant has been accomplished, rather than merely an investigational pilot plant. In this respect, the whole of the plant items are identical with those envisaged on a larger installation. Certain modifications have been necessary since the outset, but that was one of the objects of the exercise.

The plant can be operated on coal gas or hydrogen up to a pressure of 1,000 p.s.i.g., although for normal requirements it has been found that pressures in excess of 600 p.s.i.g. are rarely required, even when using coal gas. Flexibility of operation has been available, and has indeed been required, to deal with a wide variety of feedstocks. These have included high temperature coke oven benzole, horizontal and vertical retort benzole and tar works naphthas. Successful results have been obtained over the whole range of experiments.

In addition to the feedstock variations, it has been possible to study the effect of changes in the catalyst composition, shape and method of retention within the catalyst vessel. Polymerisation of unsaturateds at the temperatures and pressures employed can be a source of trouble, and the pilot plant has been utilised to find the means of circumventing this possibility.

Some of the results obtained, when operating the pilot plant, will now be discussed.

High temperature coke oven benzoles. A very good defronted crude benzole was hydrorefined with coal gas at a pressure of approximately 600 p.s.i.g. The analysis of the crude and refined products is shown in Table 2.

TABLE 2.

	Crude benzole	Hydrorefined benzole
Sulphur as CS_2	·014% w/w	·0003% w/w
Sulphur as thiophene	—	·0000% w/w
Total sulphur	·507% w/w	·0011% w/w
Bromine No.	10·2 g./100g.	Nil

The total sulphur may appear a little on the high side but the higher boiling compounds, *e.g.*, naphthalene, present before distillation account for the majority of this sulphur. The toluene and xylene from this refined benzole had sulphur contents of .3 ppm. and .2 ppm. respectively. Chromatographic analyses of the crude and refined products are shown in Table 3, which illustrates the degree of hydrogenation.

Cyclohexane from benzene is the most noticeable, but it should be remembered that the sulphur as thiophene content of the product was much less than 1 ppm. and for higher tolerances of sulphur, the cyclohexane produced would fall accordingly.

The gas consumption for this example was approximately 5 cu.ft. per gal., using a lean town gas. If a straight coke oven gas had been available then the consumption would be expected to be approximately 3 cu ft. per gal. evaluated on a thermal basis.

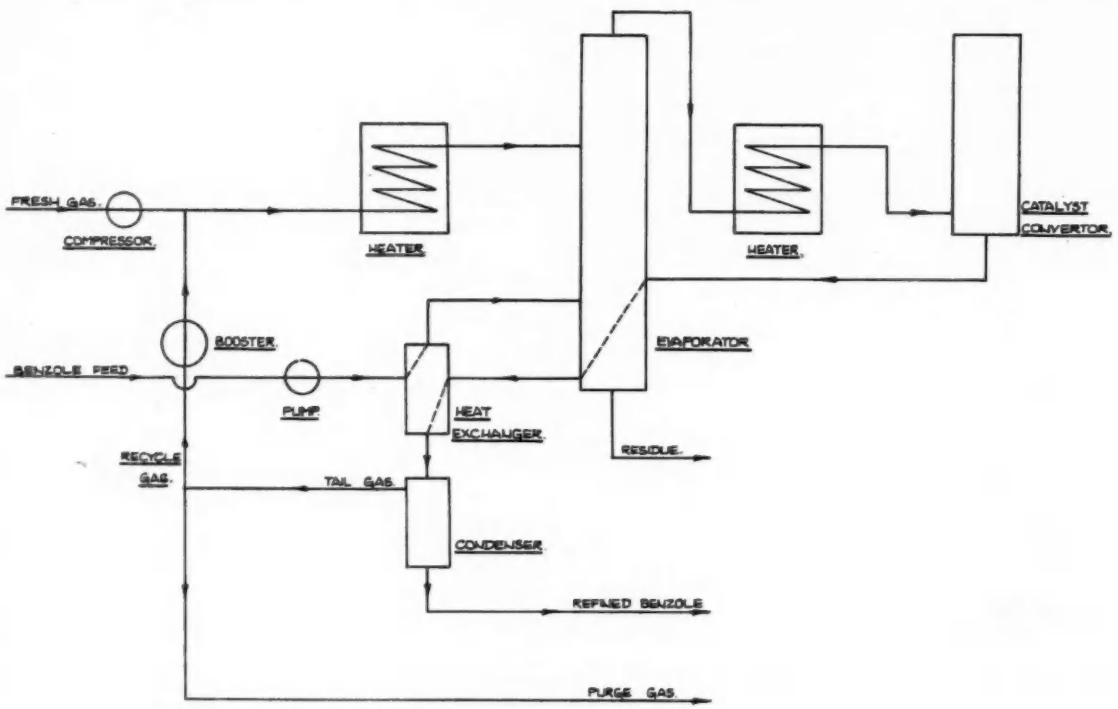

FIG. 1

CHEMICALS AND BY-PRODUCTS

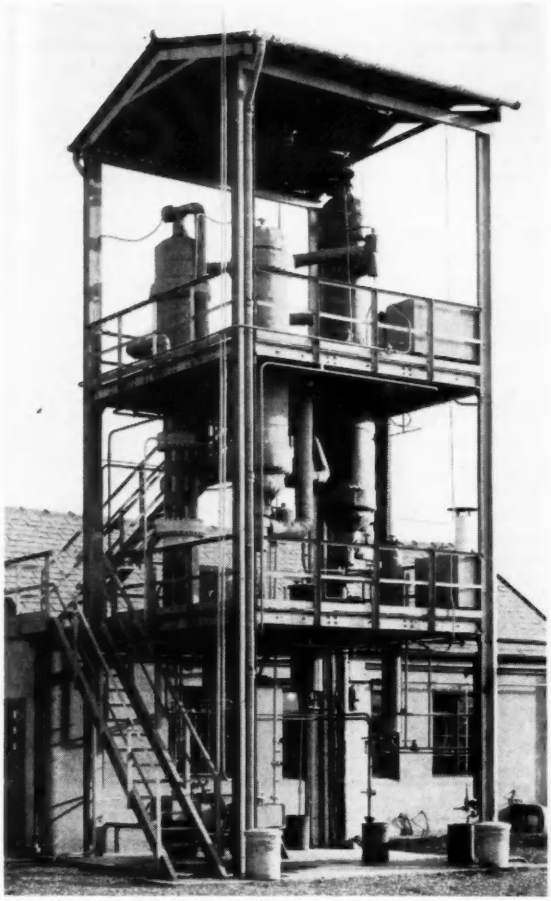

FIG. 2. *A view of the demonstration plant, built at Newton, Chambers & Co's works at Thorncliffe to examine the chemical engineering aspects of the hydrorefining process. It is capable of treating 500 gal. of crude benzole per day, and has the advantage over a pilot plant of being designed as a small full scale plant. With identical plant items as those envisaged for a larger installation, it can give a fair idea of what modifications in design might be necessary for the larger plant.*

Gas works benzole. With operating conditions very similar to those obtaining in the previous example, a mixture of vertical and horizontal retort benzole was hydrorefined. The aim of this trial was to reduce the sulphur content of the whole benzole to a low limit without any subsequent distillation. Obviously from this class of feedstock, no attempt was to be made to produce benzene, toluene and xylene from the hydrorefined benzole by distillation. The crude benzole analysis is shown below.

S as CS_2	0.42% w/w
Total Sulphur	0.845%
Bromine No.	34.1 g./100 g.

An extraction of some of the more important results of the chromatographic analyses are as follows.

Benzene	50%
Toluene	13.7%
Xylenes	6.0%
Cyclopentadiene	1.266%

As indicated by the bromine number, the crude benzole contained a considerable quantity of unsaturated hydrocarbons, not the least of which is cyclopentadiene, which was shown to be present in a substantial proportion. Cyclopentadiene is one of the main causes of polymerisation in hydrorefining plants and yet under the system now operated at Thorncliffe, no difficulties were encountered during these trials.

The product from the plant was found to have a sulphur content of 13 ppm. of which 9 ppm. were present as CS_2. The sulphur as thiophene content of the benzole was .53 ppm. These figures were considered quite acceptable for a plant operating on coal gas with a hydrogen content over the catalyst of 30 to 35% of the gas.

The consumption of gas in this case was much higher than in the previous one due to the highly unsaturated nature of the benzole. The actual gas consumption was 28 cu.ft. per gal., whereas with a coke oven gas this would have been expected to be in the region of 23 cu.ft. per gal. on a thermal basis.

It is of interest to note that the naphthas produced from this benzole on distillation were water white, colour-stable products of good odour. These characteristics are of great importance in the solvent market and trial runs have been performed on the plant with this market in mind as can be seen from our third example.

Tar plant naphtha. The fixed sulphur content of naphthas is not of prime importance, the characteristics already mentioned taking precedence. It should be noted, however, that corrosive sulphur cannot be tolerated. Experimental runs were therefore carried out to remove the unstable colour-forming hydrocarbons. It has been found that the manufacture of colour stable naphthas by hydrorefining was more difficult than sulphur removal from benzoles. Nevertheless, by using the C.T.R.A. process

TABLE 3.
Analyses of crude and hydrorefined coke oven benzole

Constituent	Crude product, %	Refined product, %
C_6 Hydrocarbon	—	·006
C_5 n Hydrocarbon	—	·008
Cyclopentane	—	·019
Cyclopentadiene	·004	—
n Hexane	—	·015
?	—	·001
Unsaturated	·029	—
Methyl cyclopentane	·002	·050
Methyl Hexane	·007	—
Benzene	71·530	72·351
Thiophene	·862	—
Cyclohexane	·052	·357
?	·001	—
Dimethyl Cyclopentane	·001	—
n Heptane	·016	·045
Dimethyl hexane	—	—
Methyl cyclohexane	·070	·108
Ethyl Hexane	·007	—
Toluene	14·316	14·574
2 Methyl thiophene	·113	—
3 Methyl thiophene	·118	—
n Octane	·013	·047
?	·001	·015
?	—	0·013
Nonane	·004	·057
Ethyl Benzene	·077	1·510
m + p Xylene	3·022	3·230
?	·486	·005
O Xylene	·501	·553
Styrene	·898	—
224 Trimethyl pentane	·001	—
Residue and Loss	7·869	6·061

CHEMICALS AND BY-PRODUCTS

(B.P. No. 823,926) which employs a mild acid wash treatment, it was possible to reverse the previous findings and actually perform this task more easily.

The crude naphtha was washed to remove tar acids and bases before processing and its analysis was:

Total sulphur	.80%
Bromine No.	55.6 g/100 g.
Distillation	5% @ 110°C
	89% @ 210°C

Again the raw material was highly unsaturated but no polymerisation difficulties were encountered. Operating at a plant pressure of 400 p.s.i.g. and again using coal gas as the hydrogenating medium, a refined product of the following analysis was obtained.

Sulphur .. .. .07%
Bromine No. .. .. 3.9 g./100 g.

The gas consumption was in this case only 7.2 cu.ft. per gal. The naphtha fractions on distillation were entirely satisfactory from the point of view of colour, colour stability and odour. An important item when producing solvents is that the hydrogenation of aromatics must still be kept to a minimum as the solvent power is dependent on the aromatic content. Low pressure hydrogenation, followed by mild acid washing succeeds in satisfying this requirement.

The individual fractions produced by distillation had the analyses shown in Table 4. The analyses of the crude fractions produced by distillation are given for comparison.

TABLE 4.

Fraction	0—125°C		125—160°C		160—190°C		190—210°C		210—225°C	
	Crude	Refined	Crude	Refined	Crude	Refined	Crude	Refined	Crude	Refined
Colour	Yellow	Water white	Red	Water white	Dark brown	Water white	Dark brown	Water white	Brown	Very pale yellow
Odour	Bad	Sweet	Bad	Sweet	Bad	Sweet	Bad	Sweet aromatic	Bad	Sweet aromatic
S.G.	·847	·815	·845	·838	·877	·855	·873	·853	·885	·870
Bromine No.	26·5	·5	39·30	4·00	49·80	2·71	41·10	2·88	40·00	2·54
Total S	·78	·030	1·00	·050	·71	·065	·61	·092	·65	·050

In the benzole refining industry, there are two distinct outlets for the desulphurised product. On the one hand is the motor benzole market, which is mainly supplied by the refined lower gravity benzole, and on the other is the pure chemicals market normally supplied by refined coke oven benzole. The further treatment required when making motor benzole is a simple fractional distillation to remove the naphthas, which may be worked up for sale independently. However, the manufacture of pure benzene, toluene and xylene from the refined benzole requires far more effort.

Pure product manufacture from a benzole of the quality shown in Table 3, is not difficult by the distillation technique when the specifications laid down by the National Benzole Association are to be met. The main impurity in the benzole after hydrorefining, is cyclohexane. This can be removed by a defronting operation when the cyclohexane/benzene azeotrope (b.pt. = 77.5°C., benzene content, 55%) can be separated from the benzene. Fortunately defronting is not too costly, either in capital or operation costs, since the quantity of top product is small. The difficulty in distillation arises when benzene has to be separated from a hydrocarbon having a higher boiling point. There are two such saturateds boiling between benzene and toluene which fall into this category, *viz.*, n-heptane and methyl cyclohexane. N-heptane, b.pt. 98.4°C., is by far the worst offender although methyl cyclohexane, b.pt. 101.0°C., is not easily separated. Although n-heptane has a boiling point almost 20°C. greater than benzene, it does not behave ideally. As the concentration of n-heptane in benzene decreases, so does the relative volatility of the benzene to the n-heptane, making benzene separation from it a very uneconomical operation, especially when high purities are required.

A similar position arises with toluene and the dimethyl cyclohexanes, although the tolerance is a little higher with toluene than with benzene. In the benzole quoted, however, the quantities of these hydrocarbons are not sufficiently high to warrant any separation. The problem resolves itself therefore to the distillation of the ideally behaving benzene, toluene and xylenes, after an efficient defronting. This can readily be seen by reference to Fig. 3.

Here we have two distillation curves compiled from data obtained under identical distillation conditions. The top curve was plotted from the distillation of hydrorefined benzole and the lower one from the distillation of the same crude benzole after acid washing. It is of interest to note the loss of toluene and xylene on the acid washed sample, a point which will be enlarged upon later.

Distillation difficulties, of the type just described, are encountered when hydrorefining a crude benzole which is sub-standard; that is to say, one which already contains a small proportion of interfering hydrocarbons plus the potential ones in the form of unsaturateds which are converted to the relevant paraffins and naphthenes, *e.g.*, cyclohexene, n-heptene. In such cases the benzene can economically be extracted from the refined benzole by the crystallisation process developed by Newton, Chambers & Co. Ltd.

This process is capable of extracting benzene from any impurity normally associated with it, with the exception of thiophene. A pilot plant, Fig. 4, has been erected, and the process has exceeded the promise shown by laboratory investigations.

The flow diagram in Fig. 5 gives the outline of the process. A benzene fraction, produced by distillation, is first prepared. In most cases no defronting operation is necessary and the distillation step is simply a benzene fraction separation from a toluene/xylene fraction.

The benzene fraction is pumped in admixture with cold

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BENZENE

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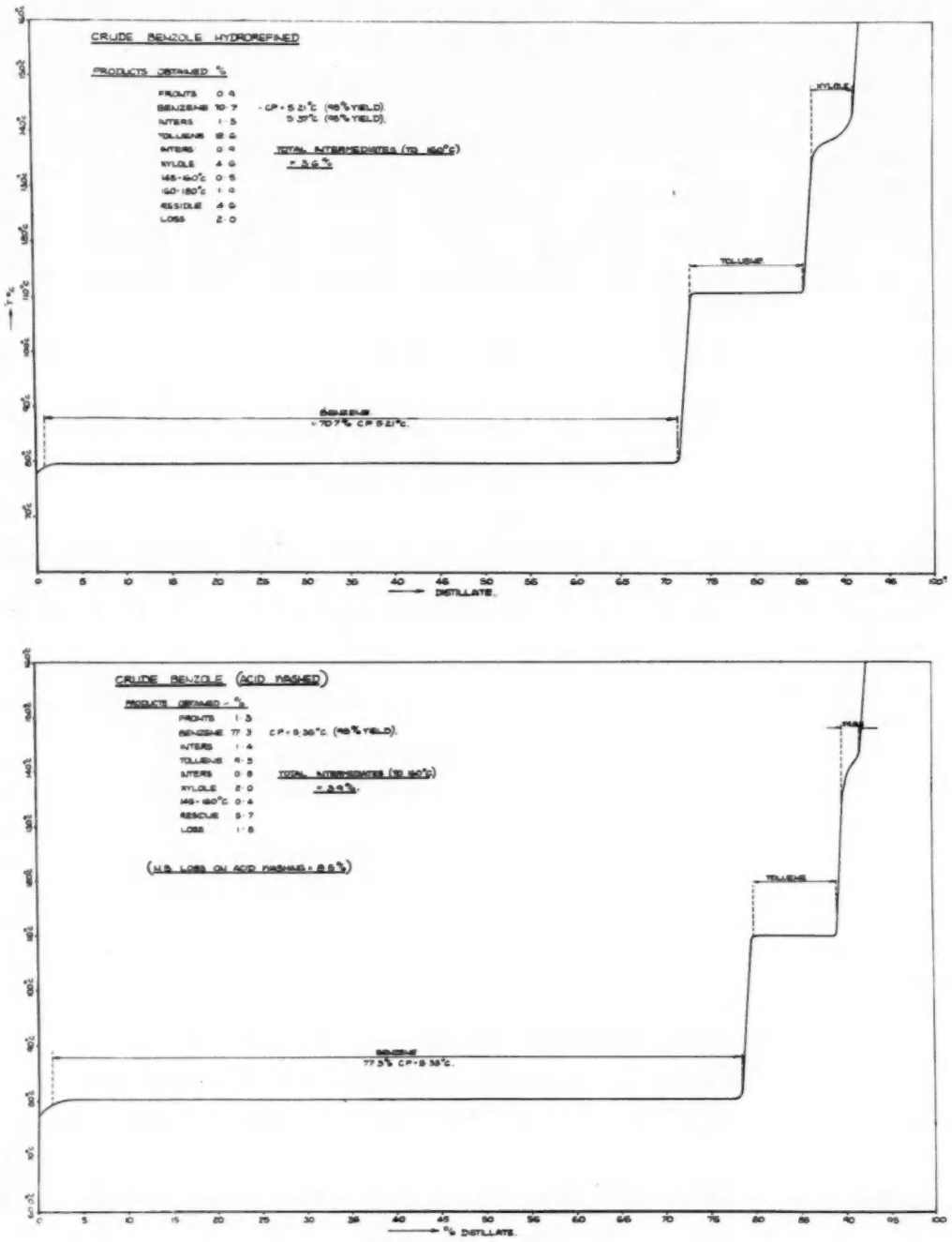


FIG. 3.

brine into a spinning centrifuge. The pumping is stopped by an automatic mechanism at a predetermined time. Spinning of the crystals is then carried out for a measured length of time to remove brine and mother liquor. The brine and mother liquor are separated, the mother liquor passing forward as motor benzole and the brine being returned to the refrigeration plant for recirculation. Washing of the crystals in the basket is then activated by the timer, followed by a further period of spinning. The liquor and aqueous wash liquor are separated. In this case the organic layer is recycled to the feed and the aqueous liquor is recirculated in its own closed system. Crystals are then ploughed from the machine, again by automatic control, after which the cycle is recommenced.

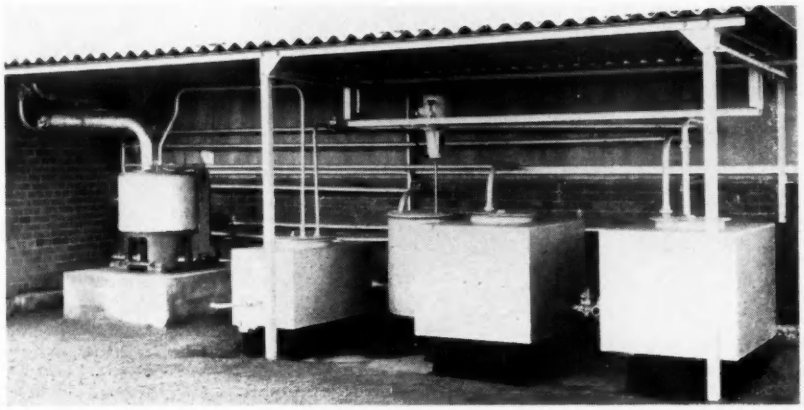
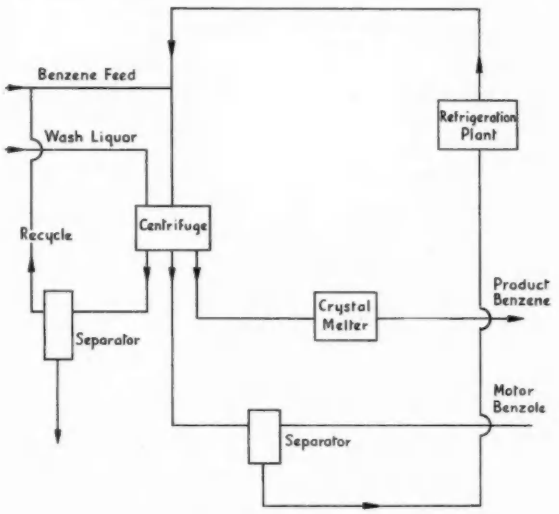


FIG. 4.

By this method it has been possible to produce benzene with a crystallising point of 5.5°C. from feedstocks which have hitherto been considered suitable only for the motor benzole market. It has been shown conclusively by pilot plant work that benzene of very high purity can be produced from hydrorefined benzole, regardless of the origin of the crude benzole. This overcomes the criticism, levelled at the hydrorefining process, that paraffin production made it too expensive to treat the refined products. It must be agreed that this merely accomplishes benzene production, but as benzene is by far the largest proportion of the crude, plus the facts that toluene and xylene are not so difficult to separate by distillation as is benzene, one has the solution of almost the entire problem.



FLOW DIAGRAM FOR BENZENE PRODUCTION BY CRYSTALLISATION

FIG. 5.

In the hydrorefining process, therefore, one has a method of benzole refining which has advantages far in excess of its disadvantages. Its acceptance throughout the world is proof enough of this statement. The acceptance has been based on the better return for capital expended, brought about by a number of considerations. The most important of these is the greater product yield obtained by this process than by its classical rival, acid washing. Sulphuric acid causes the polymerisation of unsaturated hydrocarbons, and also the sulphonation of the desirable aromatics. This is particularly noticeable in Fig. 3. Naphtha washing is very costly in this respect, where 15% of the crude can be converted to unsaleable polymers and sulphonates. The petroleum industry, who treated similar fractions with acid, have long since been converted to the hydrorefining process.

Not only is the acid washing process costly, but it brings with it an effluent disposal problem of some magnitude. Hydrorefining, on the other hand, has only a gaseous effluent which presents no insurmountable difficulty.

While the capital costs of hydrorefining are in excess of those for acid washing, the reagent costs are much less. The only reagent required is a hydrogen bearing gas. At coke ovens the problem is easily solved and this gives independence of outside suppliers of sulphuric acid and caustic soda.

Table 5 is an assessment of the comparisons made, and shows quite clearly the financial desirability of hydrorefining. The advent of crystallisation has completed the supremacy of hydrorefining over the acid washing process.

TABLE 5.
Comparative costs of hydrorefining and acid washing

Item	Hydrorefining	Acid washing
Capital cost	£150,000	£60,000
Operating costs	pence/gal.	pence/gal.
Labour	·16	·16
Gas		
Reaction	·10	—
Heating	·11	—
Power		
Compressors	·20	—
Other	·13	·05
Water	·02	·01
Catalyst	·06	—
Other Stores	·03	·03
Repairs and Renewals	·16	·26
Supervision	·41	·41
Fixed Charges	·86	·35
Reagents	—	·75
Steam	—	·30
	2·24d./gal.	2·32d./gal.
Product value	40½d/gal. crude.	38d./gal. crude

Extra profit per year=£47,000.
Extra capital paid off in 1·9 years.

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THE SUPERCHEF IS EASY TO CLEAN
In fact, it is "wipe-over" clean in a few seconds.

Distillation plant for hydrorefined benzole

By R. POLLARD,

Technical and Sales Manager, R. & J. Dempster Ltd.

THE first hydrorefining plant to be installed in this country for the treatment of benzoles from coal carbonisation was built for Lancashire Tar Distillers Ltd., at Cadishead near Manchester in 1959. A description of this plant appears elsewhere* but it may be of interest to describe the batch distillation plant, designed and built by R. & J. Dempster Ltd. of Manchester for the purpose of treating the hydrorefined naphtha, see Fig. 1.

FIG. 1. *The distillation column for the hydrorefined benzole is seen on the left. Of 2-m. diameter, it contains 70 plates of the Coppee-Montz design, the first to be used in this country, and effectively produces four aromatic fractions, separating them from non-aromatic compounds of nearly related boiling points.*

The column is 2,000 mm. in diameter, comprising 70 plates and includes the usual ancillary plant. The still is of large capacity to take a charge of 16,000 gal.

The problem involved separating four aromatic fractions within narrow limits and it will be appreciated that the presence of non-aromatic compounds close to the boiling points of the aromatic products necessitated the employment of efficient fractionating equipment and optimum reflux ratios.

An important feature in the use of batch distillation equipment concerns the requirement of low hold-up in the column to ensure clean cuts and for this reason the Coppee-Montz plate was used, for the first time in this country.

The plate is illustrated in Fig. 2 and will be seen to be of a tunnel hood design. Seventy plates were adopted, the hold-up being 5% of that normally prevailing in the well-known orthodox bubble cap plate and pressure loss of the order of 66% of the latter.

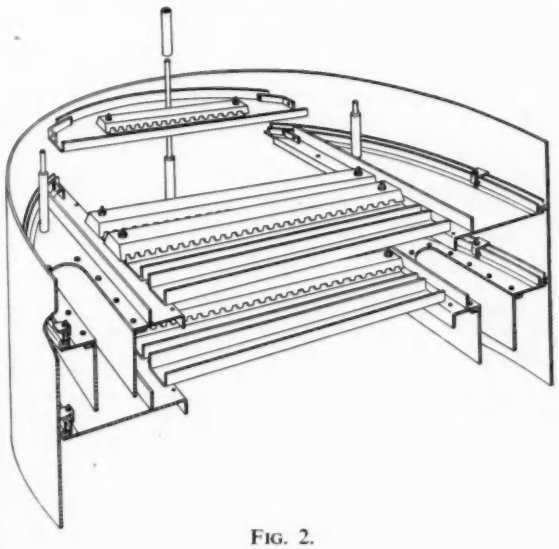

FIG. 2.

The plant designers were greatly assisted by the earlier laboratory work carried out by the Lancashire Tar Distillers Ltd., under the direction of Mr. W. T. Herbert, who had arrived at the optimum number of plates in the column in relation to reflux rates.

The height of the column meant that even with plates of minimum pressure drop, some account had to be taken of the available steam pressure to ensure correct column top conditions for the maximum stripping of the residue. This feature required the use of vacuum conditions for the larger part of the cycle.

* '*Hydrorefining of benzole and light tar oils from c.v.r. plant*', by *J. B. Lane.*

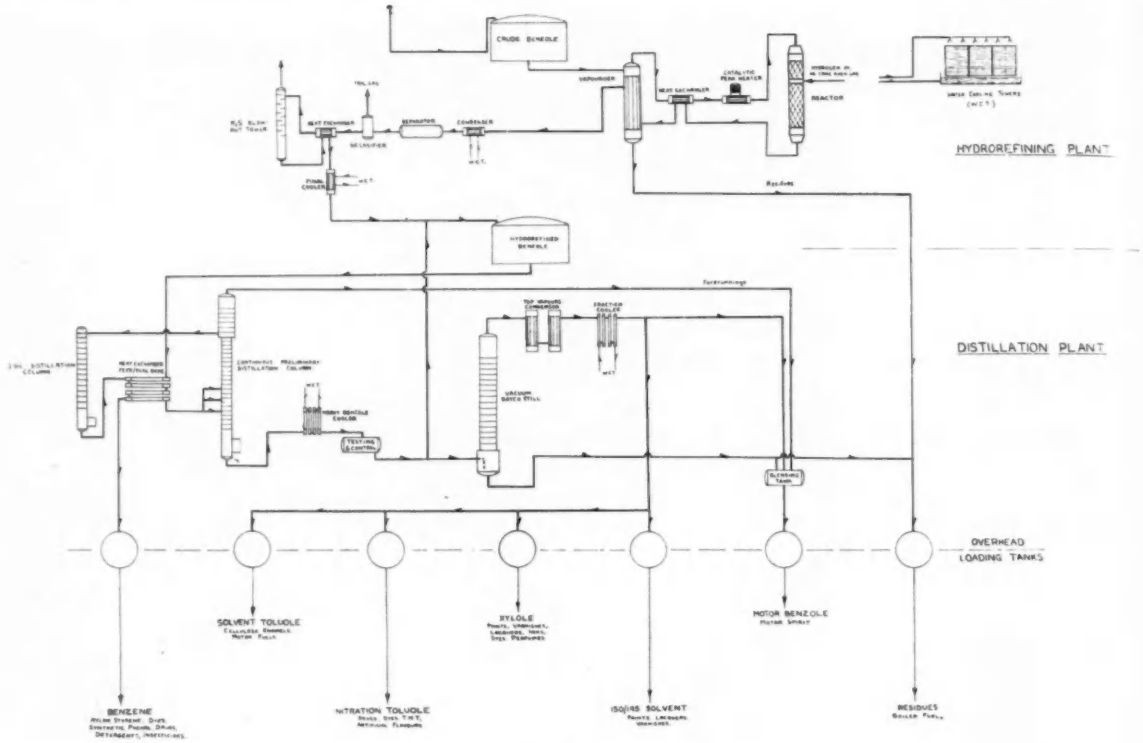

FIG. 3.

The preliminary design calculations for a distillation cycle of a throughput of 8,000 gal. to be distilled in 24 hours, are shown in Table 1.

TABLE 1.

Product	Reflux ratio	Boil-up gal. per hour	Product rate per hour, gal. per hour	Hours	Quantity, gal.
1st fraction ..	20:1	3,590	171	3·50	600
2nd fraction ..	4·9:1	3,590	610	·99	607
3rd fraction ..	15/1	3,250	203	4·68	950
4th fraction ..	3·7/1	2,790	592	2·53	1,500
5th fraction ..	1·4/1	2,100	875	2·16	1,884
6th fraction ..	3·1/1	1,220	297	5·80	1,720
Residue					739
Total				19·66	8,000

The instrumentation and control of the plant is simple but effective. A differential pressure controller operates the steam control valve at the inlet to the kettle or still, so that a virtually constant vapour load is maintained on the column. Immediately prior to the point where boiling at atmospheric pressure is no longer possible, the vacuum pump is started on open vent. The vent valve is connected to the D.P.C. system, and after the maximum temperature in the kettle has been reached, it is closed as necessary to maintain the predetermined column loading or differential pressure. The system has worked extremely well.

The plant was put to work in October 1959 and subsequent tests have shown that lower reflux rates than those predicted above suffice to produce the required separation and this is indicative of a higher column efficiency than expected. Performance is steady under both atmospheric and vacuum conditions, the plates being very tolerant to changing conditions.

The Port Talbot Chemical Co. Ltd. was formed by the Lincolnshire Chemical Co. Ltd., and the Steel Company of Wales in 1959 to refine the benzole from the Steel Company's coke ovens at Port Talbot.

It was decided to install a Lurgi hydrorefining plant and treat the raffinate by distillation. R. & J. Dempster Ltd., collaborated with the Lurgi Company of Frankfurt in the design of the distillation plant to the overall design function supplied by Port Talbot Chemical Company, which comprised a continuous benzole plant and a batch distillation plant for pure toluene, xylene and solvent production.

The manufacture and installation of the whole of the distillation plant has been undertaken by R. & J. Dempster Ltd., and includes a large tank farm. Construction is now under way and it is expected to start up in October 1960.

The hydrorefined benzole although rich in aromatics contains many compounds either forming azeotropes with benzene or boiling close to that of the aromatic. In addition there are many compounds of lower boiling point which must be stripped from the benzole in a defronting column. All these aspects are referred to in greater detail elsewhere in the literature.

The plant has been designed for a throughput of 850 gal. per hour of hydrorefined benzole and the batch distillation plant to keep in step with the equivalent toluene, xylene and solvent fraction. The raffinate would have the approximate analysis shown in Table 2.

TABLE 2.

Fraction	Proportion
Fronts, b.p. up to 81°C.	2·9%
Benzene	67·4%
Toluene	18·2%
Xylenes	6·6%
Residue	4·9%
Total	100·0%

Continued on p. 354

Hydrorefining of benzole and light tar oils from c.v.r. plant

By J. B. LANE,

Technical Managing Director, Lancashire Tar Distillers Ltd.

LANCASHIRE Tar Distillers Ltd., receive crude benzole and tar produced, in the main, by continuous vertical retorts. The crude tar is distilled to produce a light oil from which phenols and tar bases are extracted and which is finally fractionated to give a hydrocarbon distillate of 95% boiling below 200°C. This product is mixed with crude benzole received direct from the gasworks and becomes the feedstock for hydrorefining. Such raw materials are referred to as 'low gravity' because, unlike materials from coke oven sources, it is not entirely aromatic and, on average, has a non-aromatic content of 15-25% consisting mainly of paraffins and olefins. In addition, all crude benzoles contain unsaturated aromatics, such as styrene, indene and coumarone so that a mixture, as described above, would have a bromine number in the range 35-40 g./100 ml.

The advantage of hydrorefining is that it gives products almost completely free from sulphur compounds, and with a superior colour, smell and acid wash test to similar products by acid refining, without suffering the high losses which the latter process entails by polymerisation of the unsaturateds.

The disadvantages are the high capital cost of the plant and the adoption of techniques not familiar to the British refiner.

The plant operated by Lancashire Tar Distillers Ltd., was manufactured by Lurgi of Frankfurt, and has now been in operation just over 12 months. The technique of operation is quite simple, and after three months training, has been operated quite easily by one man per shift.

Recycle of hydrogen

The plant has a capacity of 800 to 1,000 gal. per hour, depending on the hydrogen uptake of the feedstock and is operated at 28 atmospheres with catalyst temperature between 350 and 400°C. The hydrogen is supplied in road-borne cylinders at 200 atmospheres by Murgatroyds Salt & Chemical Co. Ltd., of Sandbach and reduced to working pressure. Each road trailer has a gross capacity of 55,000 cu.ft. (n.t.p.) with a utilisation of 40,000 cu.ft. down to working pressure, and represents four hours' working.

The process relies on the recycle of hydrogen, and fresh gas is added to keep up the working pressure between the two reactors. The only loss of hydrogen is that dissolved in the liquid naphtha at working pressure. The hydrogen feed does not, therefore, require volumetric control and the hydrogen content of the tail gas is solely controlled by its solubility, which is small, in refined hydrocarbons.

The heat evolved on hydrogenation of sulphur compounds and unsaturateds is sufficient, with adequate heat exchange, to provide the heat for vaporisation of the feed and preheat of the vapours to reaction temperature, the residue from the evaporation being continuously withdrawn from the system. Hydrogen sulphide and gaseous products of the reaction are removed by solution at the working pressure in the condensate from the gas stream after the reactor. These gases are released on pressure let-down to 4 atmospheres, into the tail gas main. Final traces of hydrogen sulphide are removed from the product by distillation at .8 atmospheres gauge and are collected in the tail gas main.

The naphtha is then free from hydrogen sulphide and is separated on the hydrorefining plant to motor benzole and a mixed solvent fraction by a fractionation at atmospheric pressure. The mixed solvent is distilled in a still built by R. & J. Dempster Ltd., described elsewhere in this issue.*

Typical results achieved in the guarantee run are as follows:—

1. Feed 955 gal. per hour.

Sulphur w/w 1.02% as CS_2	.41%
Specific Gravity 15.5/15.5	.856
Bromine No. g./100 ml.	36.0
Phenols w/w	.3%
Basic nitrogen	233 ppm.

Distillation, drip 76°C.; 5 c.c., 90°C.; 50%, 132°C.; 95%, 204°C.; dry at 215°C.

2. Products.

	Motor Benzole	Solvent	Residue
Gal. per hour	458·4	293·0	195·3
Specific gravity 15·5/15·5	·838	0·847	0·877
Total sulphur	> 1 ppm.	> 1 ppm.	—
Thiophene	not traced	not traced	—
Bromine No. g./100 ml.	·07	·432	—
Acid wash	1	4	—
P & E gum mg./100 ml.	1·0	—	—
Doctor test and corrosive sulphur	passed	passed	—

3. Physical Loss.

2.5% w/w (note loss by removal of CS_2 and thiophene 2.0%)

4. Tail Gas.

About 2,000 cu.ft. per hour.

5. Services per ton of feed.

Electricity	17.58 kW.
Steam	.228 tons.
Cooling water	5,600 gal.
Process water	about 10 gal.
Hydrogen	10.79 cu.ft. per gal.
	13.57 cu.ft. per gal. of product.

6. Effluent.

80/90 gal. per hour.
Ammonia 3 to 5 g. per litre.
H_2S 3.3 g. per litre.

* *'Distillation plant for hydrorefined benzole' by R. Pollard.*

GROWING USE OF WELDING

WELDING, today, frequently involves using new materials and working to standards which were inconceivable only a few years ago. The net result is that, apart from maintaining a large 'minimum' programme of work, the British Welding Research Association is increasingly being called upon to meet specific problems in design, in selection of welding conditions and in the choice of materials.

This is particularly evident from the 15th Annual Report of the Association which, in referring to the need to increase its income solely on the basis of present commitments, points out that a programme more than double the size of the current one already exists.

In outlining its work the Association shows how its sometimes apparently esoteric activities have a very real bearing on industrial problems and economics. The study of the welding arc—long regarded only as a source of heat—is thus seen in relation to filler wire diameters and compositions, the development and improvement of welding equipment, methods of gas shielding and the establishment of optimum welding conditions for the whole range of structural metals.

In regard to the widely shared problems of metal fatigue and brittle fracture, the results of experimental work on the controlled use of local heating and/or mechanical conditioning as a means of increasing strength have been verified and it has been shown that service life can be extended far beyond the levels at which failure would normally be expected to occur. Methods of applying such techniques, now being worked out, will eventually lead to a marked reduction in failures from such causes.

The replacement of mechanical joints by welded connections in high-pressure small-bore pipe systems could provide a far-reaching economy in the construction of chemical plant, and investigations carried out during the year show this to be a practical possibility. Similar economy-based and rationalised design studies in the fields of pressure vessel construction indicate the need for revision of standards long regarded as sacrosanct.

A particularly important advantage of collective research is that specific investigations often yield information of value to other sections of industry, if not industry in general. The Government sponsored work on the resistance welding of stainless steel flame tubes for gas turbines is a typical example, since both the material used and the techniques involved play a part in constructions for modern high temperature, high pressure processing techniques. Research of this type can frequently provide, well in advance, answers to problems which are likely to arise in plant construction.

Apart from its outline of the general programme, the Report deals with the ever increasing number of problems posed by members. In an expanding industry, using new materials and techniques to closer tolerances than ever before, it is inevitable that problems will multiply. Conscious not only of the need to meet these demands as speedily as possible, but to make available the results of general research without delay, the Association has considerably strengthened its Liaison and Advisory Services. A full time design staff is now working directly with members' own personnel in producing designs specifically for welding, while, among other things, a bi-monthly Bulletin has been introduced to give notice of the Association's work in all fields.

By its sheer versatility welding offers the manufacturer more opportunities for error in application than does any other form of jointing and when one relates this to the quantity and variety of welding now carried out in most engineering concerns the true value of co-operative research becomes apparent.

R. POLLARD: continued from p. 350

When it is realised that 30% of the fronts boil within the range of 70 to 81°C. and that 10% could be cyclohexane which forms an azeotrope boiling at 77.7°C. containing more than 50% benzene, it will be appreciated how much thought must go into the design of the defronting column. An important feature of the operation of this column concerns the use of an optimum relationship between the number of plates above the side stream and reflux ratio. The latter must be of a high order but the indiscriminate use of high reflux ratios could affect the steam consumption figure to such an extent that production costs would rise.

Consideraion of these variables has made it possible to predict a steam consumption figure not more than that found in modern acid washed benzole distillation plants for a product of high crystallising point and lower sulphur content than that normally found in acid washed material.

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The fifth column in the small bore war

By **W. H. JOHNSON,** *M.Inst.Gas E., M.Inst.F.*

ANYONE who takes as it were a benevolently avuncular interest in the affairs of the gas industry will be interested to note that for certain new appointments the candidates are expected to have a knowledge of competitive fuels. This has a counterpart in family life in 'letting them rough it a bit,' or Getting To Know About Life.

Goodness know why the qualification has so far been applied only to industrial sales engineers. We have certainly passed the time when the man who lit his retort house by electricity was regarded as a traitor, but has anybody with a complete gasification plant considered the economics of oil for steam raising?

But to return to the industrial engineer, and more specifically to one of his present preoccupations—small bore heating. Small bore is another name for a battlefield, on which a bitter war is likely to be waged for another two or three years.

This knowledge of competitive fuels is therefore strategically necessary in order to press home the advantages of a gaseous fuel which requires no storage and leaves no ash, thus justifying its cost. This is text-book warfare, and no more than an intensification of a struggle which has been going on on a broad front for many years.

Another insidious party

There is no text book to warn students that there is another and insidious party to the struggle for the rich pickings off small bore, whose single intention is to make a lot of money quickly, before the sales peak declines. One has only to see what happened to the oil heater industry because of a very few mishaps, to realise what could happen to small bore if it once got a bad reputation.

To come down to cases: Small bore heating is a system, flexible only within limits. If a house of a certain size needs 'H' B.t.u. per hour to maintain its temperature in winter, there must be a boiler which will produce at least that output, a circulator and radiators to handle that heat in terms of water volume, and a thermostatic controller for comfort and fuel economy.

A larger house will require its apparatus built around an output of (H + h) B.t.u., as every industrial gas engineer knows, but few of the public seem to know. That is why there is a good living being made right now by the men who, in the writer's unhappy experience, sell central heating by the pound sterling. Never mind where you live, or what size your house is!

'£300 a bit expensive sir? Try this special line, only £270.'

They go in for special lines. There are, of course, wars within wars. As the number of circulators on the market increases, so a shilling or two is trimmed off the price, and there is less tendency to emphasise such virtues as prolonged silent running.

As for thermostatic controllers, the very heart of fuel efficiency—well, they tend to add to the cost. It is a pound or two cheaper to supply an entirely new device, made specially for the purpose which, if you examine it, is a common plugcock, or worse, in fancy dress.

So the whittling goes on, till the lowest common denominator is reached. There is another step, in which the circulator and what passes for a controller are bracketted on to the boiler, and there you have it—a packaged unit.

To quote one of the leading men in this last development: 'It's cost, you see. I must have the turnover to get my profit. And people don't like paying for heating engineers, and plumbers. So we take a chap who's never seen a spanner and show him how to use it, and then he joins this lot up to a few radiators. Using nylon pipe, see? Doesn't have to know pipe fitting.' See?

It amounts to this, that the future reputation of small bore heating, hence its future as a large market, could be determined by such people as this. For they are likely to sell as many ill-fitting shoddy units as are sold reputable ones, merely on price.

It should therefore be the business of everyone engaged in selling small bore heating as a system to see that the public is aware that it is a system, not a cheap lucky dip. This rather sterile evangelism is given more interest if one can quote typical figures to show that a saving in capital outlay can be lost in the first year of running costs, with inefficient plant.

A wide survey of the national Press leaves an impression that the gas industry is not hammering home the supreme advantages of gas for central heating, not as impressively as the solid fuel people, and both are far behind the uninhibited oil sellers, whose advertising allocation is presumably much greater. There is, however, a chink in the massive armour of the latter.

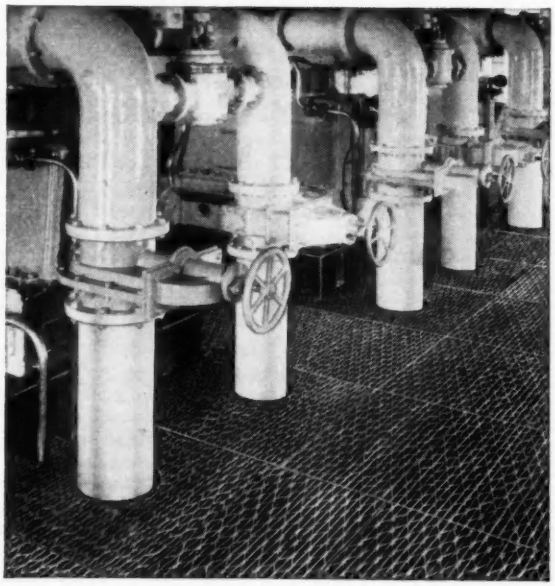
For while the gas and solid fuel people are respected (by the relatively few who know about it) for the fact that they are organised to advise all and sundry upon installations as a comprehensive system, the oil companies issue certificates to all manner of people who request to become registered installers.

What about giving the System angle, and the advisory service, the top line in the advertisements, for a change? Even the dumbest of householders seems to know by now that gas is a clean fuel. How many, faced with a problem of heating, whether of water, space or anything else, think first and automatically of calling at the showrooms? It would be a good habit to encourage, and would bring home to a substantial number of people that, by contrast with it, any attempt to foist on them technical equipment without proper technical advice to match it has the taint of spivvery about it.

Specifications for benzole products

THE recently published 'Standard Specifications for Benzole and Allied Products 1960' is the fourth edition of this book originally published in 1929. Containing the standard specifications for benzenes, toluenes, xylenes and coal tar naphthas, as well as the methods of testing these products, it has been thoroughly revised by the National Benzole and Allied Products Association in the light of current requirements of the chemical industry. The committee responsible for the work is representative of all sections of the producing industry together with those of the users specially co-opted for the work.

It is published by National Benzole and Allied Products Association, Granville House, 132-135 Sloane Street, London S.W.1, at 30s.



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STAFFA

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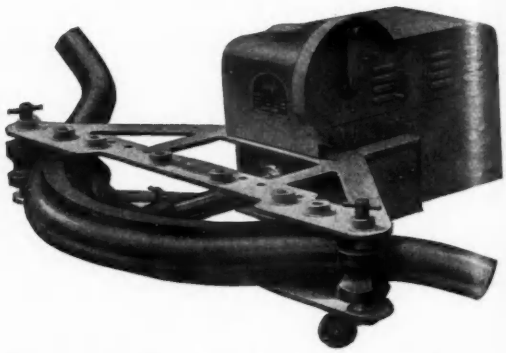

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INTERNATIONAL COOKS ATTRACT THE CROWDS

NEWS SUPPLEMENT

OVER a hundred cooks from twelve countries are using nearly a thousand ingredients to prepare a great variety of dishes at Olympia every day. The Gas Council's spectacular feature at the British Food Fair is attracting hosts of visitors to the dozen separate kitchens which constitute their latest edition of International Kitchen.

The countries are America, Belgium, Denmark, France, Ghana, India, Italy, Netherlands, Pakistan, Spain, Wales and the West Indies. The kitchens, each in a different colour scheme, are gaily decorated with ornaments from each country. Each has its own cooker, water heater and refrigerator, and a further display of over 30 appliances is on view to tempt those impressed by the equipment in use.

Housewives and students

The demonstrators, all of whom are expert cooks, are for the most part housewives but they have the assistance of students from their countries who are over here to obtain their diplomas in cookery and housecraft. The teams include diplomats' wives and daughters, and members of the staffs of embassies, high commissions and legations.

International Kitchen was introduced to the Press by Sir Harry Brittain, K.B.E., C.M.G., who, as the only founder left of the British Travel and Holidays Association, hoped that British housewives would learn the secrets of some of the interesting dishes they would find at Olympia and so enlarge our daily bill of fare.

Sir Harry Brittain, the well-known traveller and sole remaining founder of the British Travel and Holidays Association, samples the vino on the Spanish stand at the Gas Council's International Kitchen at the British Food Fair.

Gas to electric

Stoke-on-Trent city council finance committee have agreed to the spending of £36,000 on the first step of replacing the city's remaining gas street-lights with electric lamps. The sum will pay for 1,000 electric lamps, after which the remaining 7,500 gas lamps will be replaced in stages.

H. & G. awarded Partington Onia-Gegi contract

HUMPHREYS & GLASGOW LTD. have been awarded a contract for the installation of an Onia-Gegi catalytic reforming plant at the Partington works of the North Western Gas Board. The plant will be built in two sections and completed in January, 1962. Its output is designed to be 12 mill. cu.ft. of gas a day, but substantial overload capacity will be built in. Feedstock is refinery gas from an adjacent petrochemical works at the rate of 60,000 therms a day. Alternatively there is provision for using liquefied petroleum gases as standby.

Cooling towers contract goes to Head Wrightson

HEAD WRIGHTSON PROCESSES LTD., a subsidiary of Head Wrightson & Co. Ltd., have been awarded a contract for the supply of three induced draught cooling towers for the new Spencer Works of Richard Thomas & Baldwins Ltd.

These towers, which have a total capacity of over 1.8 mill. gal. of water per hour, will be used for supplying cooling water to the hot and cold strip mills of the finishing section of the plant. The towers, which will be built to a special design developed by Head Wrightson and John Laing & Son Ltd., will incorporate the most modern techniques in tower construction. One of the new features will be the Polygrid high efficiency plastic packing which has been proved on a number of test installations to give an outstanding performance.

CANADA EXPORTS GAS TO AMERICA

CANADIAN natural gas has for the first time been exported to America, crossing the border at Emerson, Manitoba, following the National Energy Board's approval early this year of several export projects. Trans-Canada Pipe Lines recently announced the completion of an extension from Winnipeg 51 miles to the United States border. The first Canadian gas reaching America will be used to test sections of the Midwestern Gas Transmission line.

1831 gasworks closes

The 129-year-old gas works in Strathaven, Lanarkshire, have closed down and supplies are now being provided from the West of Scotland grid.

Gas was first introduced to the town with the opening of the local works by the Strathaven Gas Company in 1831.

Old-timers live to light another night

A new lease of life, in a Cotswold setting, is promised for some of Birmingham's Victorian and Edwardian gas standards. The council of a Cotswold town thinks there is more grace and charm in Birmingham's cast-iron cast-offs than in contemporary lamp standards.

Chipping Campden Parish Council has voted to ask Birmingham if it has any surplus gas standards to spare. They want to convert the lamps from gas to electricity, by putting new electric lanterns on top of the old gas standards. Said the Council chairman, Captain G. Coles: 'We think this would blend better with the old-world appearance of Chipping Campden.'

Sympathetic response

Campden's request is likely to have a sympathetic response from Birmingham. The chairman of Birmingham Public Works Committee, Councillor D. S. Thomas, said: 'I think they have got something and I am sure something could be arranged. These old standards are out of place in Birmingham; but they might be just the thing for an old-world setting.'

With a big programme of conversion from gas to electricity in street lighting in progress, Birmingham is disposing of many hundreds of old gas lamps for scrap.

Many are sold to individual householders who want to erect them in their gardens as a reminder of more gracious days, and the Corporation has been approached by an export firm which is considering shipping hundreds of the old standards to America.

The cost? The scrap price for the old standard and lantern is £4 12s. 6d. The column itself goes for £2 10s., the 'frog' casting which supports the lantern 7s. 6d., and the lantern 35s.

Pollution by effluents

An investigation into the death of 4,000 to 5,000 trout in the River Eden between Strathmiglo and Dunshalt indicated pollution of the river by effluents from a disused gasworks at Strathmiglo, which is being dismantled. This was stated in a report by Dr. G. S. Riddell, Fife County M.O.H., to the Tay River Purification Board. Dr. Riddell said that it was up to the Board to decide whether or not any further action would be taken.

COMING EVENTS

September 8.—EAST MIDLANDS G.C.C.: Nottingham Chamber of Commerce, Smithy Row, Nottingham. 11.0 a.m.

September 10.—NORTHERN JUNIORS: Gas Showrooms, Middlesbrough. 'Materials Handling' by J. M. Wright. 2.30 p.m.

NORTH THAMES STAFF CHANGES

With the retirement of MR. H. W. GROVER, Senior Industrial Gas Engineer at Watson House, after 49 years service with the North Thames Gas Board, changes in responsibility for industrial gas engineering are announced by the Board with effect from the beginning of this month.

Mr. D. J. Davies

The Senior Industrial Gas Engineer and the Industrial Gas Engineers will come within the responsibility of the Board's Commercial Manager and be directly responsible to the Headquarters Divisional Manager, while the industrial workshops themselves will remain within the responsibility of the Board's Controller of Services.

To succeed Mr. Grover as Senior Industrial Gas Engineer, North Thames Gas have appointed MR. D. J. DAVIES whose long experience in industrial gas engineering goes right back to the time when 34 years ago, the Gas Light and Coke Company first had its Industrial Section at Goswell Road. Later, Mr. Davies served under Mr. W. Dieterichs at Watson House, and there for the past few years he has been one of the team of industrial gas engineers headed by Mr. Grover.

Another appointment announced by North Thames is that of MR. C. W. RUSSELL who is appointed as Manager of the Industrial Workshops, Watson House.

At a farewell ceremony held at Watson House to mark his retirement, Mr. Grover was presented by Mr. L. W. Andrew, Manager of Watson House, with a cheque from his many friends and colleagues.

Practically the whole of Mr. Grover's long career with North Thames Gas—a few months short of 50 years—has been concerned with the use of gas for industrial purposes, in which he is acknowledged to be one of the country's foremost authorities. For the past ten years he has been a member of the Gas Council's Industrial Gas Development Committee.

PERSONAL NOTES

MR. ROBIN HASTIE, 27 year old laboratory assistant in the North Thames Gas Board's Industrial Laboratory at Watson House has been awarded the Milne-Watson Scholarship, and MR. IVOR DELAFIELD, 21 year old electrician and ex-apprentice at Beckton works, has been awarded the Falconer Birks Scholarship. Both scholarships, open to employees of North Thames, entitle the holders to leave of absence in order to enable them to undertake full-time courses of study at a University or Technical College. The Board also makes grants to cover fees and living expenses. The Milne-Watson Scholarship, founded in 1946, is in memory of Sir David Milne-Watson, former governor of the Gas Light and Coke Company and father of the Board's Chairman. The Falconer Birks Scholarship, which is now in its third year, was instituted in honour of Mr. F. M. Birks, a former deputy chairman of North Thames, who died last April.

Mr. Hastie has decided on a three year course at Battersea College of Technology where he intends to study for his B.Sc. in chemical engineering. He has already passed his 'inter' for this as a result of part-time study at Birkbeck College.

Mr. Delafield's father and three uncles are all employed at Beckton gasworks, where he also served his apprenticeship. He plans to use his Scholarship to obtain a Diploma in Technology, and next month starts a four year full-time course at the Northampton College of Advanced Technology, Clerkenwell. He has already achieved his Higher National Certificate in Electrical Engineering.

MR. W. J. R. WATERFIELD, Station Engineer at Stratford works has retired due to ill health after 45 years of service with the North Thames Gas Board. As a result of Mr. Waterfield's retirement, the Board announce that MR. G. L. BRAIDWOOD will be Station Engineer, Stratford, and MR. T. C. TWEDDELL will be Engineer-in-Charge, Mill Hill, both appointments taking effect from October 1, 1960.

MR. C. J. GRAYSTON, has been appointed Group Research Director of the Balfour Group of Companies' recently opened Research and Development Centre at Leven, Fife. He will have overall control of all sections of the enterprise. One of Mr. Grayston's particular duties will be to supervise the Student and Graduate Apprenticeship Schemes which are now functioning within the Group.

COUNCILLOR MRS. G. F. LEE of St. Pancras, London, has been appointed a member of the North Thames Gas Consultative Council by the Minister of Power. Mrs. Lee has been a member of St. Pancras Borough Council since 1948 and of the London County Council since 1958.

MR. D. P. WELMAN, has been reappointed Chairman of the North Western Gas Board and MR. J. B. WATT and MR. J. H. T. GOLDSMITH, C.B.E., part-time members of the Board, by the Minister of Power.

MR. D. D. MELVIN, immediate past President of the Institution of Gas Engineers, has been elected to Honorary Life Membership of the Scottish Western Junior Gas Association.

MR. J. EDGE, of Merthyr Tydfil, has been appointed a member of the Wales Gas Consultative Council.